

U.S. Patent Application Serial No. 10/821,089
Filed: April 19, 2004, Inventor: James Wagner Larsen
For: Systems and Methods Useful For Detecting Presence
And/Or Location Of Various Materials
Attorney: James L. Ewing, IV, Telephone: 404.815.6494
Attorney Docket No. 14088/299978
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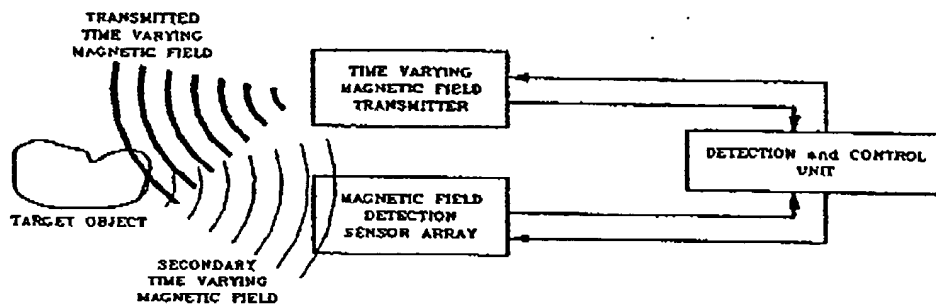


FIGURE 1-1 SYSTEM BLOCK DIAGRAM

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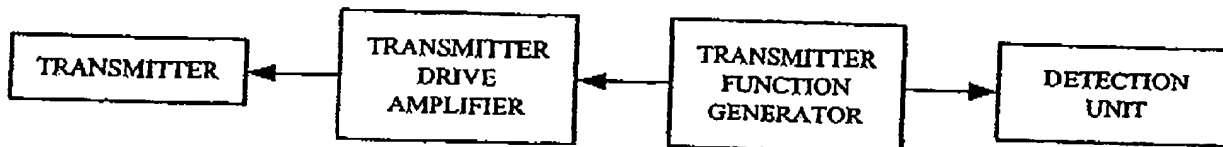


FIGURE 1-2
TRANSMITTER WITH KNOWN OUTPUT FUNCTION

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FOR: SYSTEMS AND METHODS USEFUL FOR DETECTING PRESENCE
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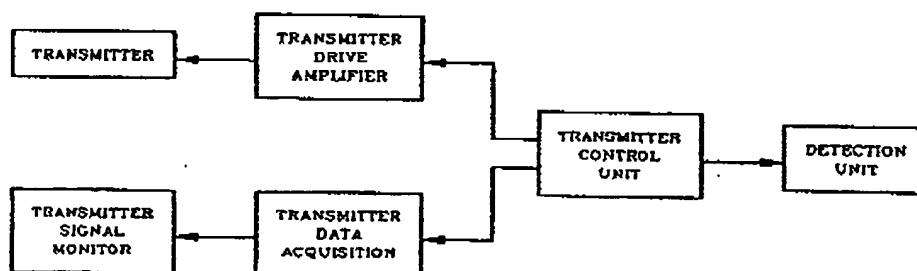


FIGURE 1-3
TRANSMITTER WITH MAGNETIC FIELD MONITOR

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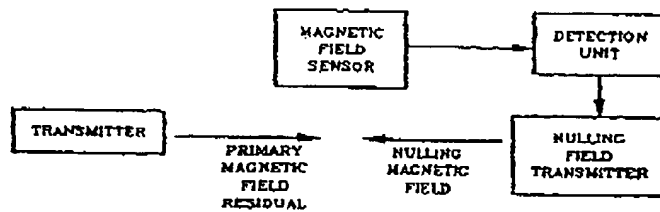


FIGURE 1-4A
RESIDUAL MAGNETIC FIELD NULLING
USING A NULLING MAGNETIC FIELD

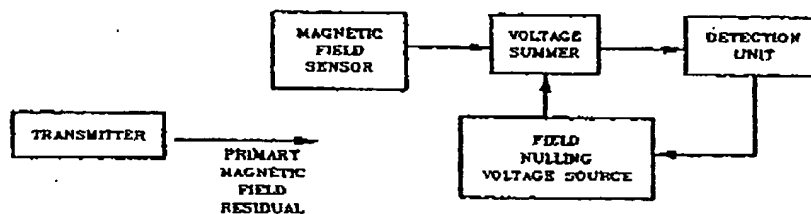


FIGURE 1-4B
VOLTAGE NULLING OF RESIDUAL FIELD SENSOR OUTPUT

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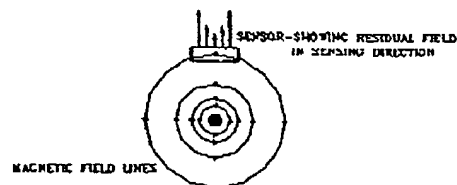


FIGURE 1-5A
TRANSMITTER COIL CROSS SECTION FOR SINGLE WIRE COIL
SHOWING SENSOR POSITION AND RESIDUAL FIELD

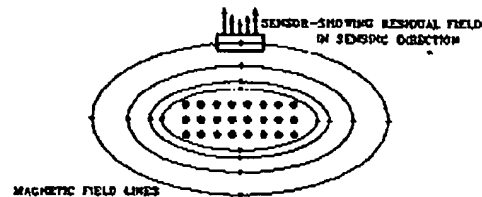


FIGURE 1-5B
TRANSMITTER COIL CROSS SECTION FOR NORMAL RECTANGULAR COIL
SHOWING SENSOR POSITION AND RESIDUAL FIELD

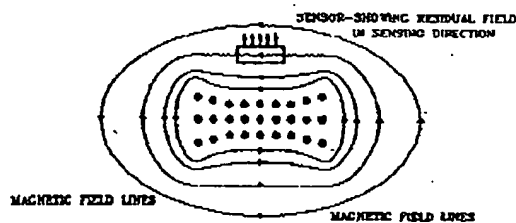


FIGURE 1-5C
TRANSMITTER COIL CROSS SECTION FOR SHAPED COIL
SHOWING SENSOR POSITION AND RESIDUAL FIELD

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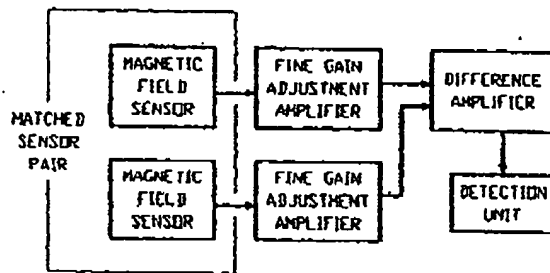


FIGURE 1-6
GRADIENT SENSING USING A MATCHED SENSOR PAIR

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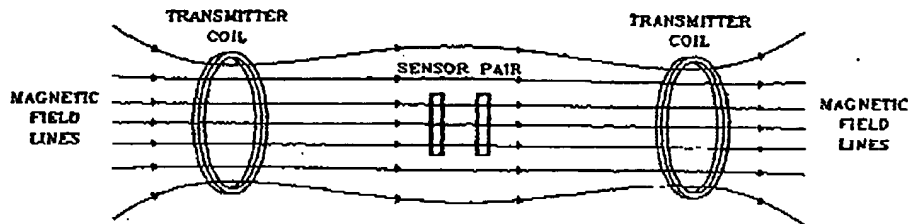


FIGURE 1-7
SENSOR PAIR CALIBRATION
USING TWO TRANSMITTER EQUAL COILS

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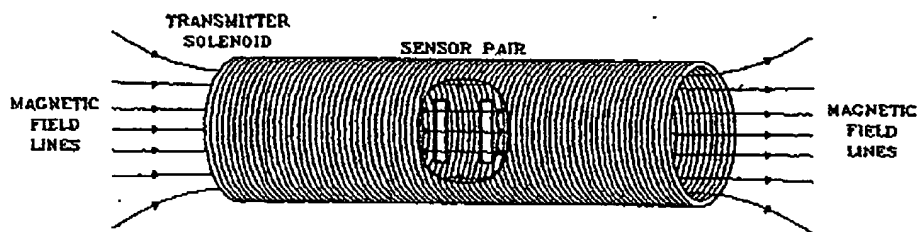


FIGURE 1-8
SENSOR PAIR CALIBRATION
USING A LARGE SOLENOID COIL

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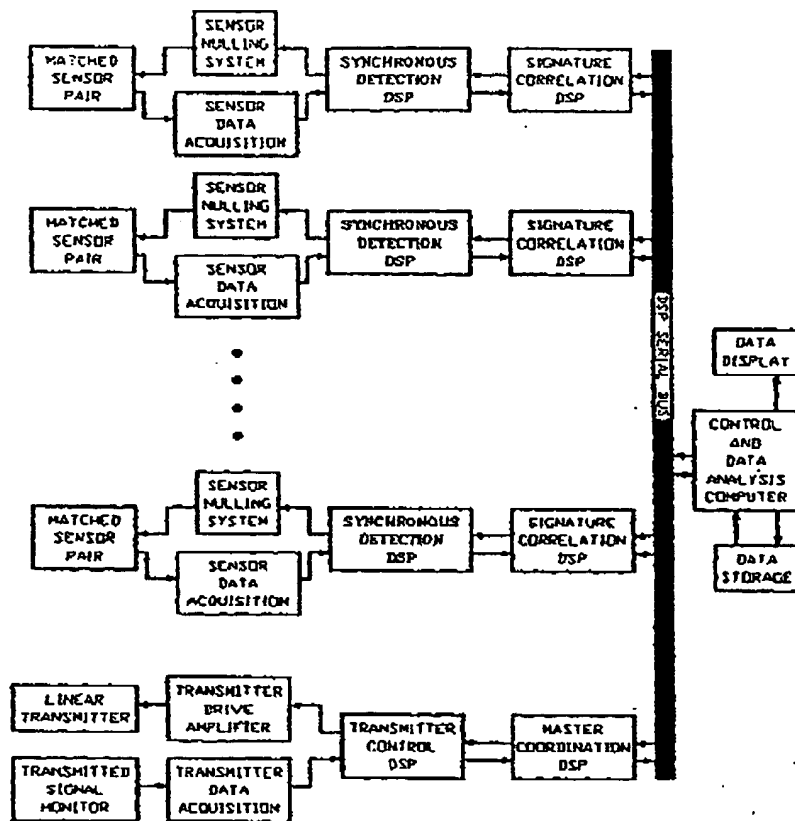


FIGURE 1-9
 SYSTEM WITH MULTIPLE SENSOR PAIRS
 AND SYNCHRONOUS DETECTION
 BASED ON DSP PROCESSORS

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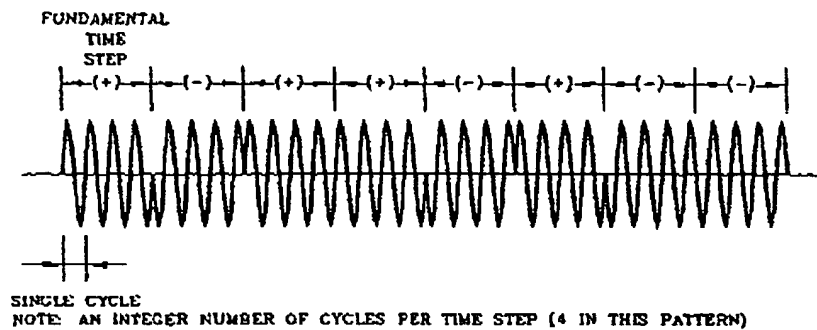


FIGURE 1-10
AN 8 SECTION (+ - + + - + - -)
TIME ENCODED WAVEFORM

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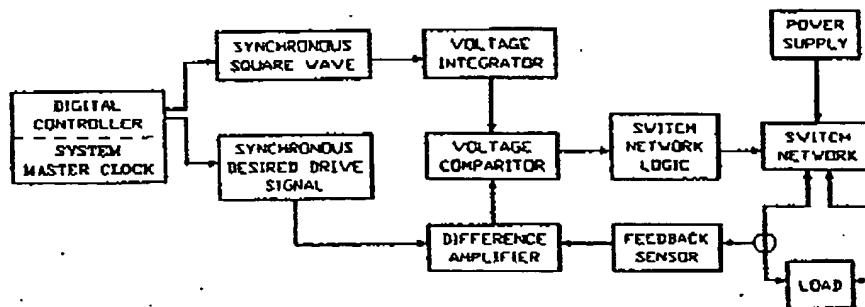


FIGURE 2-1
SYNCHRONOUS PULSE WIDTH MODULATION AMPLIFIER

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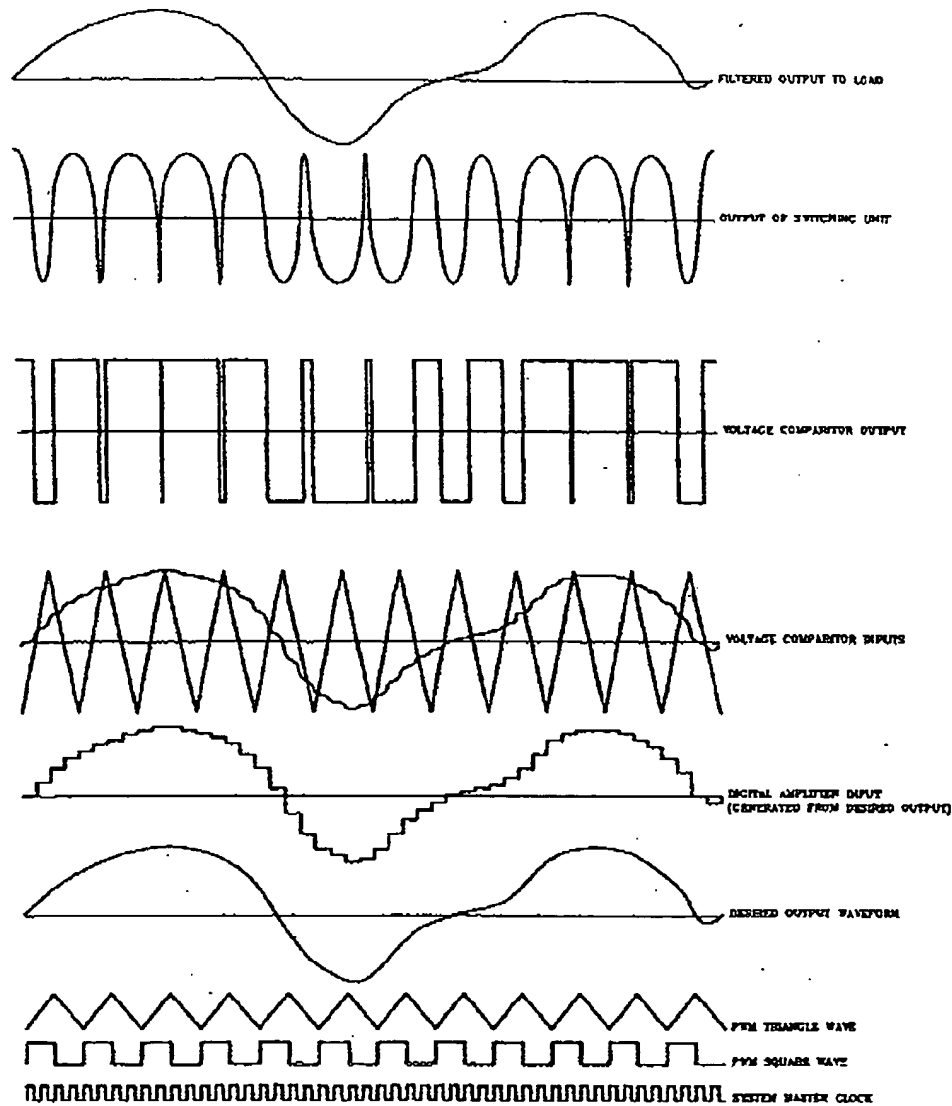


FIGURE 2-2
 TYPICAL PULSE WIDTH MODULATION WAVEFORMS

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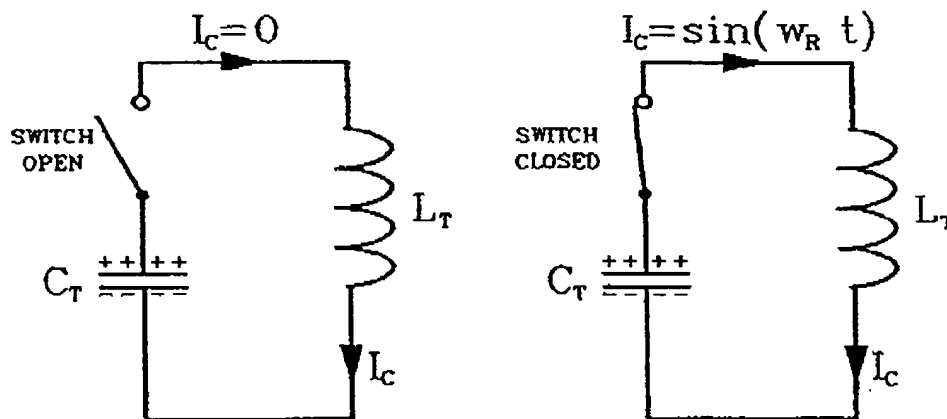


FIGURE 4-1
WHEN SWITCH IS CLOSED CIRCUIT OSCILLATES
AT RESONANT FREQUENCY, w_R

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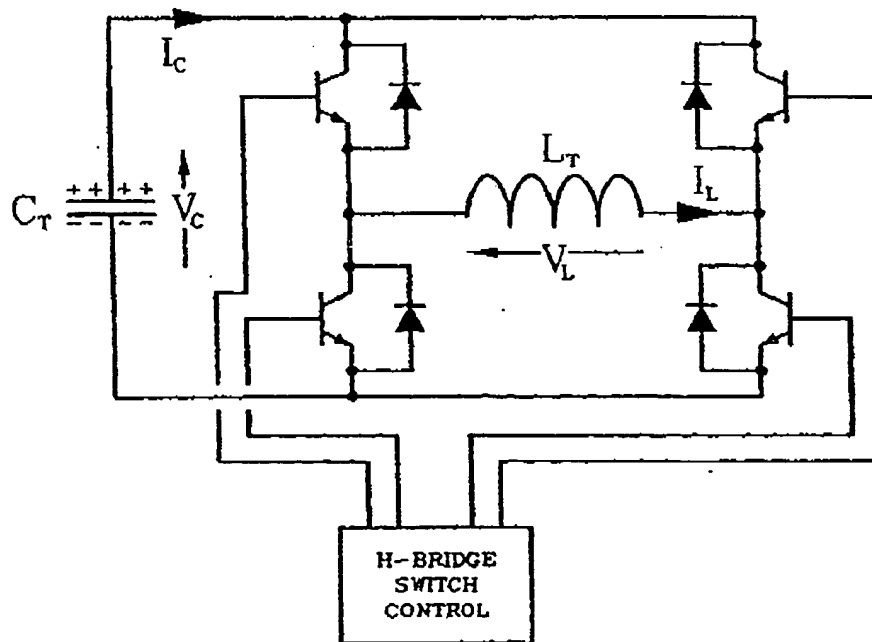


FIGURE 4-2
AN H-BRIDGE SWITCH NETWORK
CONNECTING THE CHARGED CAPACITOR
TO THE LOAD COIL

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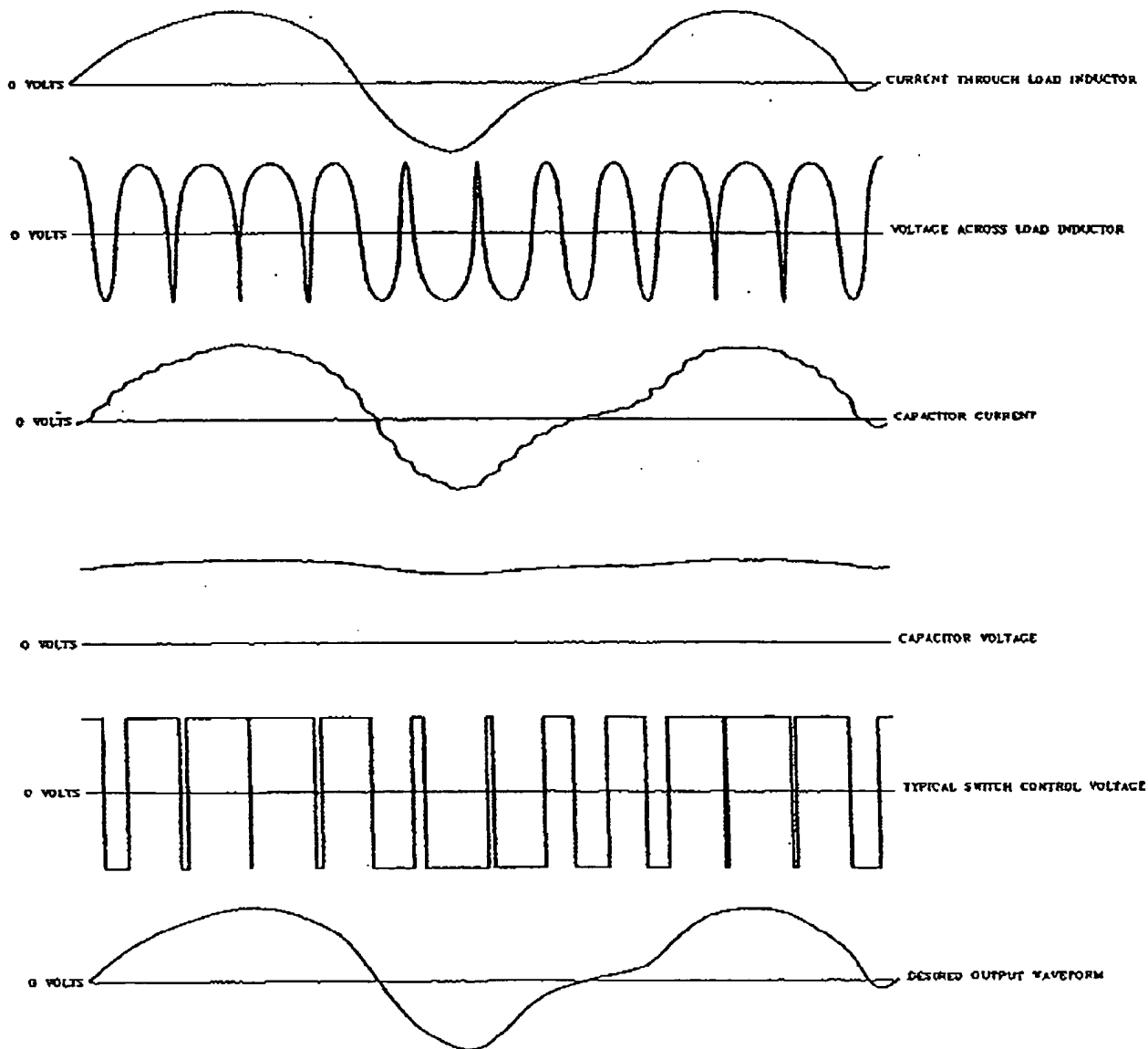


FIGURE 4-3
SWITCHED CAPACITOR CIRCUIT WAVEFORMS

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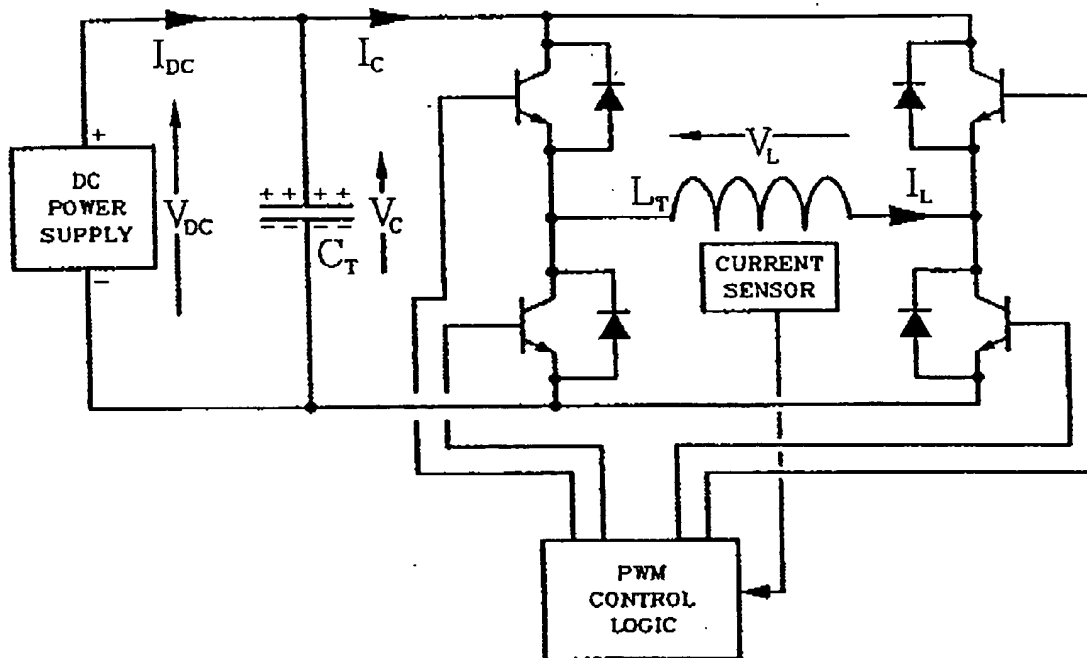


FIGURE 4-4
 PULSE WIDTH MODULATED
 SWITCHED CAPACITOR RESONATOR

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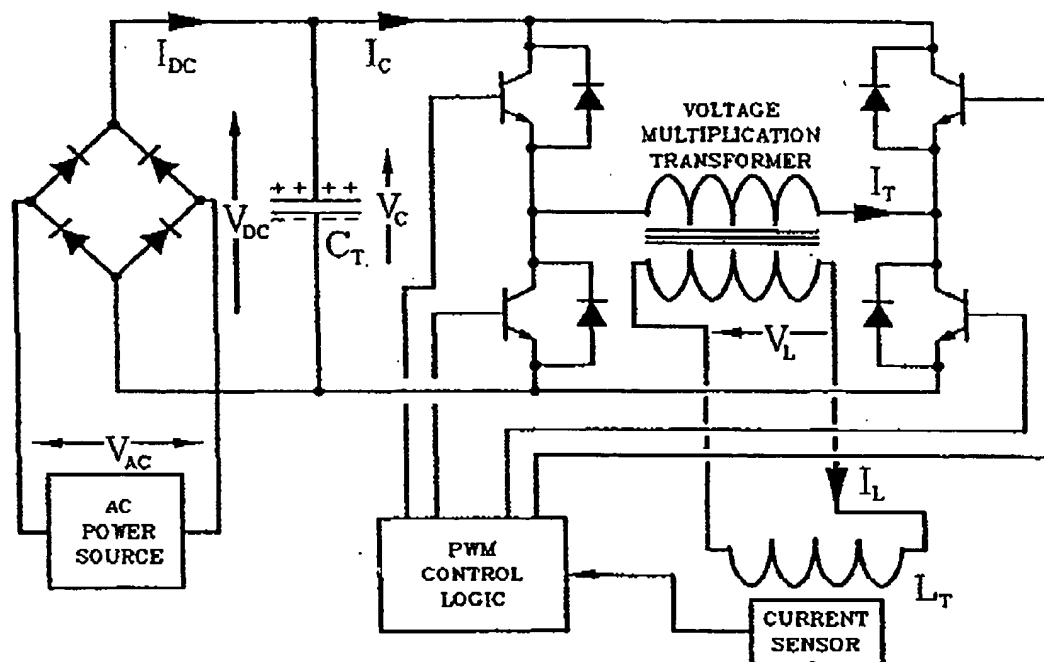


FIGURE 4-5
 SWITCHED CAPACITOR RESONATOR
 WITH INTEGRAL SWITCHING POWER SUPPLY

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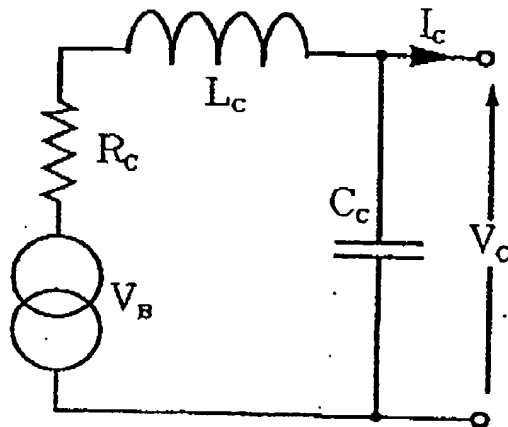


FIGURE 5-1
SENSE COIL EQUIVALENT CIRCUIT

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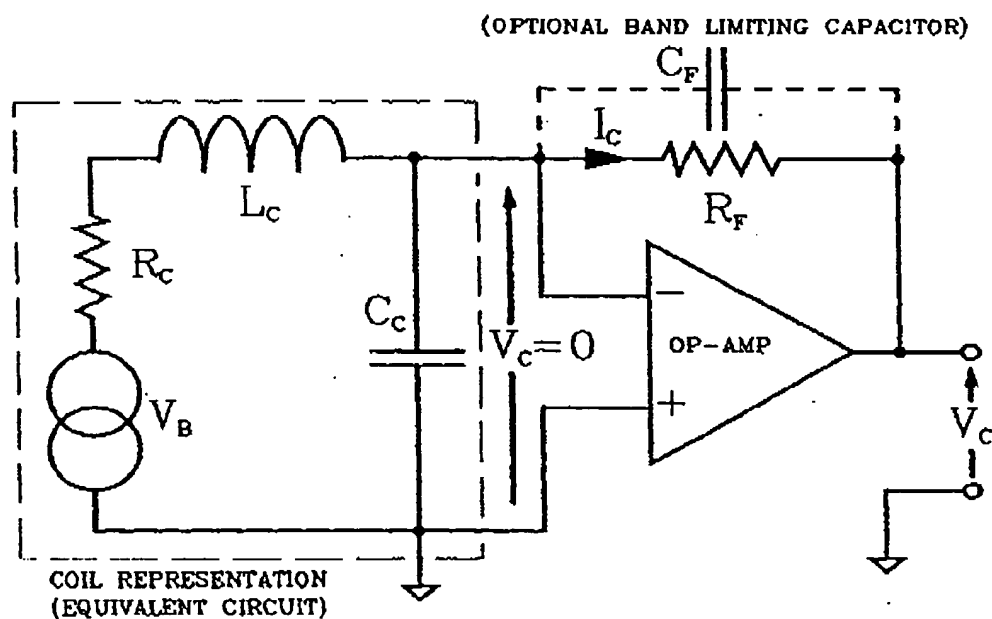


FIGURE 5-2
OPERATIONAL AMPLIFIER BASED
VOLTAGE TO CURRENT CONVERSION CIRCUIT

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SENSITIVITY FOR #32 WIRE WITH Rf+10MOhm

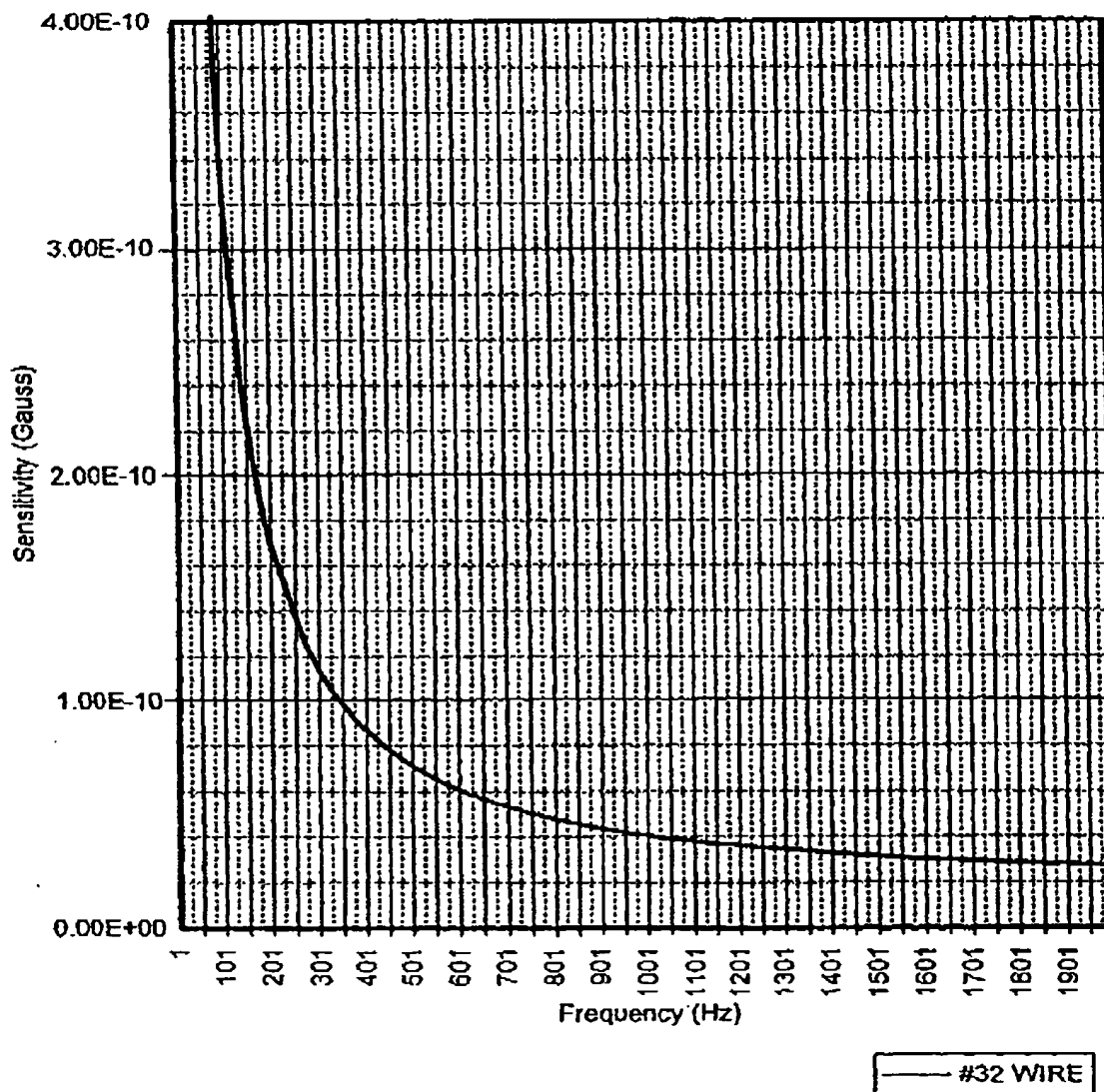


FIGURE 5-3

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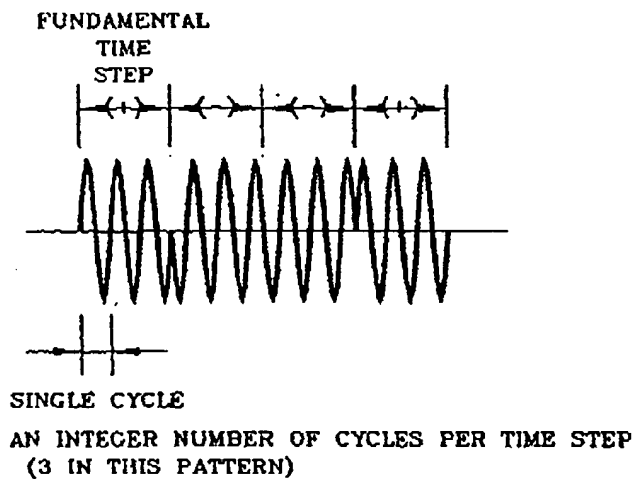
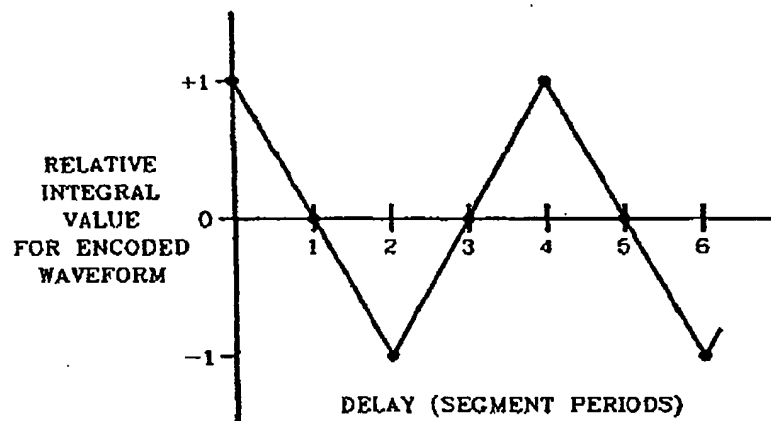


FIGURE 6-1
A 4 SEGMENT (+ - - +)
TIME ENCODED WAVEFORM

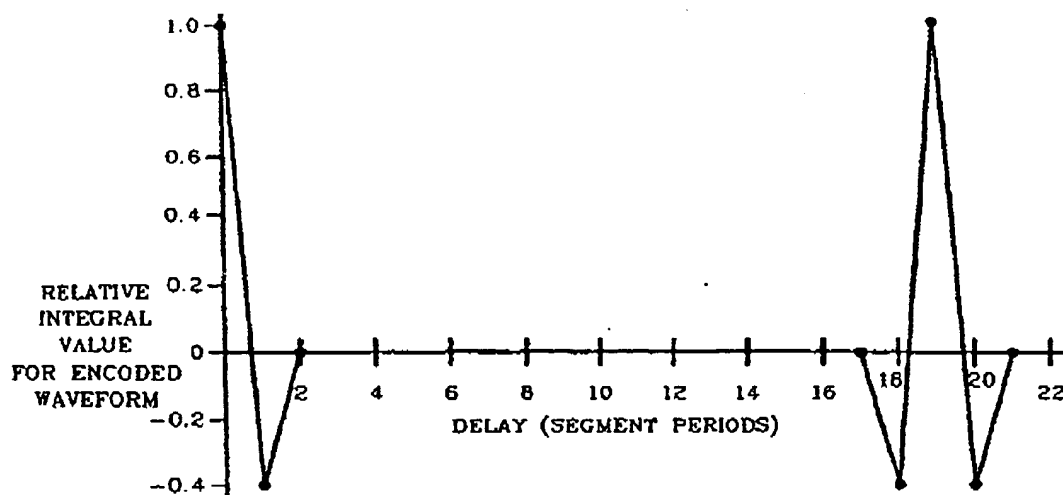
U.S. Patent Application Serial No. 10/827,089
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Attorney: James L. Bwing, IV, Telephone: 404.813.6494
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NOTE: THE INTEGRAL OF THIS WAVEFORM WITH A CONTINUOUS SINE WAVE IS ZERO

FIGURE 6-2
CORRELATION OF THE 4 SEGMENT (+ - - +)
ENCODED WAVEFORM WITH ITSELF

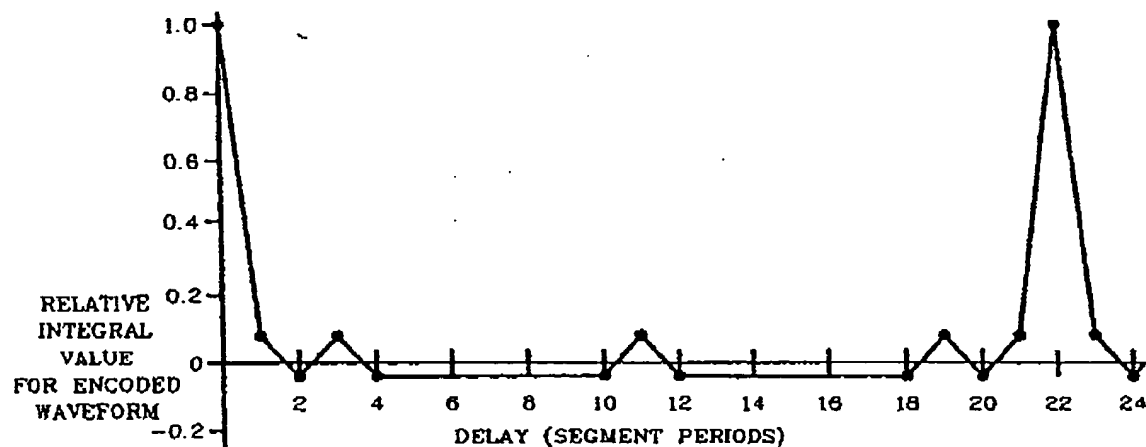
U.S. Patent Application Serial No. 10/527,039
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NOTE: THE INTEGRAL OF THIS WAVEFORM WITH A CONTINUOUS SINE WAVE IS -0.1

FIGURE 6-4
CORRELATION OF THE 20 SEGMENT
(+ - - - + + - - + - - + - + + - + - + -)
ENCODED WAVEFORM WITH ITSELF

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NOTE: THE INTEGRAL OF THIS WAVEFORM WITH A CONTINUOUS SINE WAVE IS ZERO

FIGURE 6-5
CORRELATION OF THE 22 SEGMENT
(++++-----+---+----+---)
ENCODED WAVEFORM WITH ITSELF

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Attorney Docket No. 14088/299973
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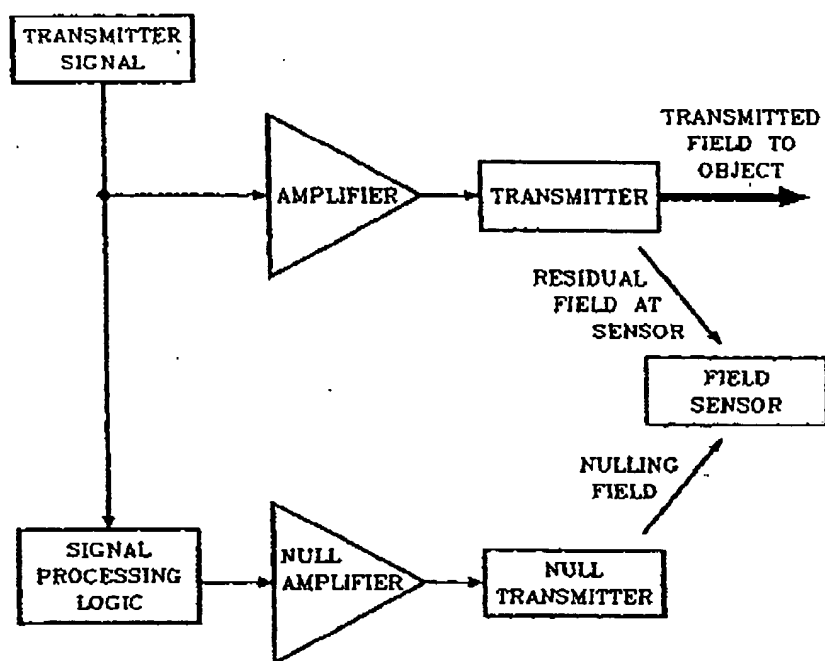


FIGURE 7-1
LOCAL MAGNETIC FIELD GENERATION
FOR RESIDUAL FIELD CANCELLATION

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